

MAINOSA, A NEW GENUS FOR THE AUSTRALIAN 'SHUTTLECOCK WOLF SPIDER' (ARANEAE, LYCOSIDAE)

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ABSTRACT. A new monotypic genus, *Mainosa*, is described to accommodate the Australian 'shuttlecock wolf spider', *Mainosa longipes* (L. Koch 1878) (= *Lycosa mainae* McKay 1979, new synonymy) as the type species. The male of this species is described for the first time. *Mainosa longipes* differs from other wolf spiders in having a the distinct color pattern of the abdomen, with white transverse bars and lines on a dark surface, and unusually long legs in males. Its genital morphology confirms *M. longipes* as a member of the subfamily Lycosinae. *Mainosa longipes* inhabits areas in South Australia and Western Australia with dry sandy soils in *Acacia* litter, where it constructs palisades around the entrance of its burrow. It appears to reproduce in winter.

Keywords: Lycosinae, Australia, turret-building, palisade, taxonomy

Australia has long been recognized for its unique fauna and flora. Two main reasons for Australia's large number of endemic species are the long period of time it has been in geographic isolation and its comparatively stable geological history (Hopper et al. 1996). Australia is thought to have split from the southern supercontinent Gondwana in the Late Paleocene, about 65 million years ago (e.g. Heatwole 1987), and some regions in Western Australia have not been subject to major geological changes in the form of glaciation or continental uplifts (mountain building) since the Triassic more than 250 million years ago (e.g., Heatwole 1987; Hopper et al. 1996). Consequently, the spider fauna of Australia is very diverse and recent estimates suggest that some 20,000 species exist (Yeates et al. 2003).

Wolf spiders belong to one of the predominant spider families in Australia. The presence of large areas of open woodland, inland diffuse waterways (including salt lakes) and expansive arid and semi-arid regions that are all favored habitat areas of this family seems to account for this dominance (Main 1976, 1981). Recent studies have shown that the Australian and New Zealand wolf spider faunas contain some unique elements, such as the genera *Artoria* Thorell 1870, *Anoteropsis* L. Koch, 1878, *Tetralycosa* Roewer 1960, *Notocosa* Vink 2002 and *Venatrix* Roewer 1960 (Framenau 2002, 2005; Framenau et al. 2006; Framenau & Vink 2001; Vink 2002).

As part of his monumental monograph on Australian spiders *Die Arachniden Australiens*, L. Koch (1878) described the female of a wolf spider species with a very unusual color pattern of white transverse bars on an otherwise blackish-brown abdomen, *Anoteropsis longipes* L. Koch 1878. The type material of this species, part of the 'Bradley Collection', is considered lost (Framenau 2005). More than 100 years later, McKay (1979) described *Lycosa mainae* McKay 1979 from Western Australia with a very similar color pattern, also solely based on a single female and some immature spiders (Fig. 1). Earlier, Main (1976) had described the burrow of this spider and called this species the 'shuttlecock wolf spider' as these lycosids construct a palisade of litter around their burrow, reminiscent of a badminton shuttlecock (Fig. 2). A comparison of L. Koch's (1878) and McKay's (1979) descriptions of *A. longipes* and *L. mainae* strongly suggests that both species are actually the same. After the examination of more than 15,000 Australian records of wolf spiders, I have found no other species that even remotely resembles that described by L. Koch (1878) and McKay (1979).

An exhaustive investigation of the spider collection of the Western Australian Museum revealed some additional material of this species, including two males that match the females of *A. longipes* and *L. mainae*. The ped-

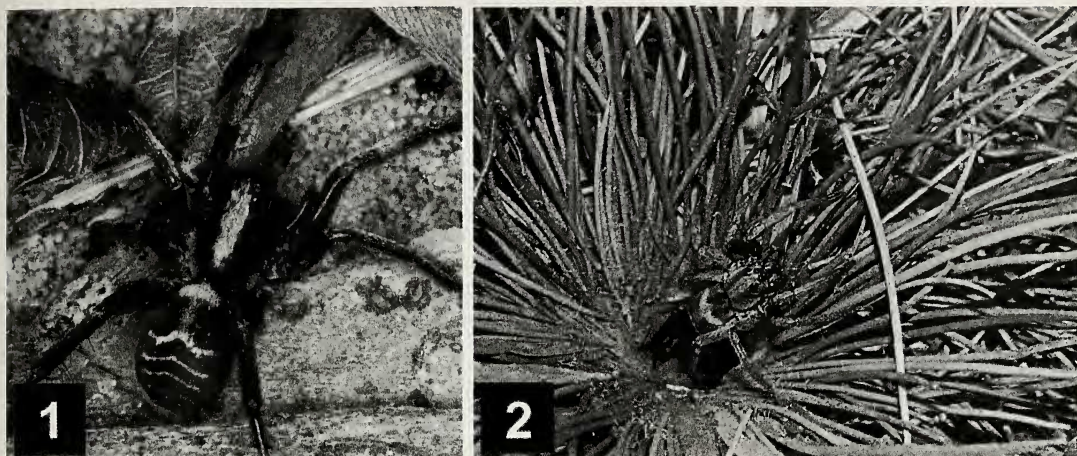


Figure 1.—Penultimate female of *Mainosa longipes* from Lorna Glen Station, Western Australia (WAM T58395). The body length of this specimen is 10.5 mm.

Figure 2.—Female of *Mainosa longipes* at the entrance of its burrow near Murchison Station, Western Australia (photograph courtesy of Fred and Jean Hort, Swan View).

ipalp structure clearly identifies it as a member of the subfamily Lycosinae (sensu Dondale 1986). Consequently, the species cannot be a member of the genus *Anoteropsis*, as recently postulated in a revision of this genus (Vink 2002), since *Anoteropsis* is considered member of an unnamed subfamily very different to the Lycosinae (Framenau et al. 2006). This species has also no somatic or genitalic similarities with *Lycosa* Latreille 1804, a putatively Mediterranean genus in which *L. mainae* was originally described (see e.g. Zyuzin & Logunov 2000).

Here, *L. mainae* is considered a junior synonym of *A. longipes*. A new endemic Australian genus, *Mainosa*, is erected to accommodate the unusual 'shuttlecock wolf spider' from Western Australia and South Australia, as it is not possible to place it in any other currently described genus within the Lycosidae.

METHODS

Descriptions are based on specimens preserved in 70% ethyl alcohol. A female epigynum was cleared in lactic acid overnight for examination of the internal genitalia. The illustrations of epigyna and male pedipalps omit the setae for clarity. The morphological nomenclature follows Framenau & Vink (2001) and Framenau (2002). All measurements are in millimetres (mm). Since juvenile spiders can be clearly identified by the distinct

color pattern, the species distribution is documented based on both mature and immature specimens.

Abbreviations.—*Eyes*: anterior (AE), anterior median (AME), anterior lateral (ALE), posterior (PE), posterior median (PME), posterior lateral (PLE). *Measurements (adult spiders, if not otherwise stated)*: total length (TL), carapace length (CL) and width (CW), abdomen length (AL) and width (AW). *Collections*: QM = Queensland Museum, Brisbane; WAM = Western Australian Museum, Perth.

SYSTEMATICS

Subfamily Lycosinae Sumderall 1833

Mainosa new genus

Type species.—*Anoteropsis longipes* L. Koch 1878.

Etymology.—The genus is named in honor of Barbara York Main. Barbara's contribution to Australian arachnology is legendary, and after two years at the Western Australian Museum, I still have not finished sorting through her part of the immense wolf spider collection. It also preserves McKay's (1979) acknowledgment of Barbara's contribution to the naming of *L. mainae*. The gender is feminine.

Diagnosis.—*Mainosa* can be distinguished from all other known wolf spiders by the unique coloration of the abdomen, consisting

of white transverse bars and lines on a brown to black surface (Fig. 1). In addition, males have unusually long legs, with a large ratio of leg length to carapace width (WAM T62713; leg 1 = 7.0; leg 2 = 6.4; leg 3 = 6.13; leg 4 = 8.6). For example this leg ratio is twice as large as the average for the species within the Australian lycosine genus *Venatrix* (leg 1 = 3.6; leg 2 = 3.2; leg 3 = 3.0, leg 4 = 4.2; data for 17 species derived from Framenau & Vink 2001).

Description.—Medium sized wolf spiders (TL 6–15 mm). Males smaller than females. Carapace elevated in head region, more pronounced in males than females (Fig. 3). Row of AE narrower than row of PME. Row of AE slightly procurved (Fig. 4). Caput flanks steep in males (Fig. 4), but a gentle slope in females. Spiders overall very dark, reddish-brown to black, however, the carapace has white setae medially resulting in a distinct median band in live specimens (Fig. 1). Abdomen with distinct light transverse bars and lines on a dark surface (Fig. 1). Chelicerae with three promarginal and three retromarginal teeth. Leg formula IV>I>II>III. Males with very long and thin legs, each at least 6 times as long as the carapace width. Females with dense scopulae on the tarsi of all legs, metatarsi I–III and the apical two thirds of tibiae I+II. Triangular median apophysis of male pedipalp directed retrolaterally and without ventral process (Fig. 5). Bulb rotated slightly clockwise, so that the large subtegulum is situated prolaterally (rather than basally) and the base of the embolus apically (rather than apicoprolateral) (Fig. 5). Terminal apophysis sickle-shaped (Fig. 7). Female epigynum with inverted T-shaped median septum, of which the longitudinal part is indistinct and the lateral edges of the posterior transverse part are slightly bent anteriorly (Figs. 8, 10).

Included species.—*Mainosa longipes* (L. Koch 1878).

Distribution.—As for species (Fig. 11).

Mainosa longipes (L. Koch 1878), NEW COMBINATION
(Figs. 1–11)

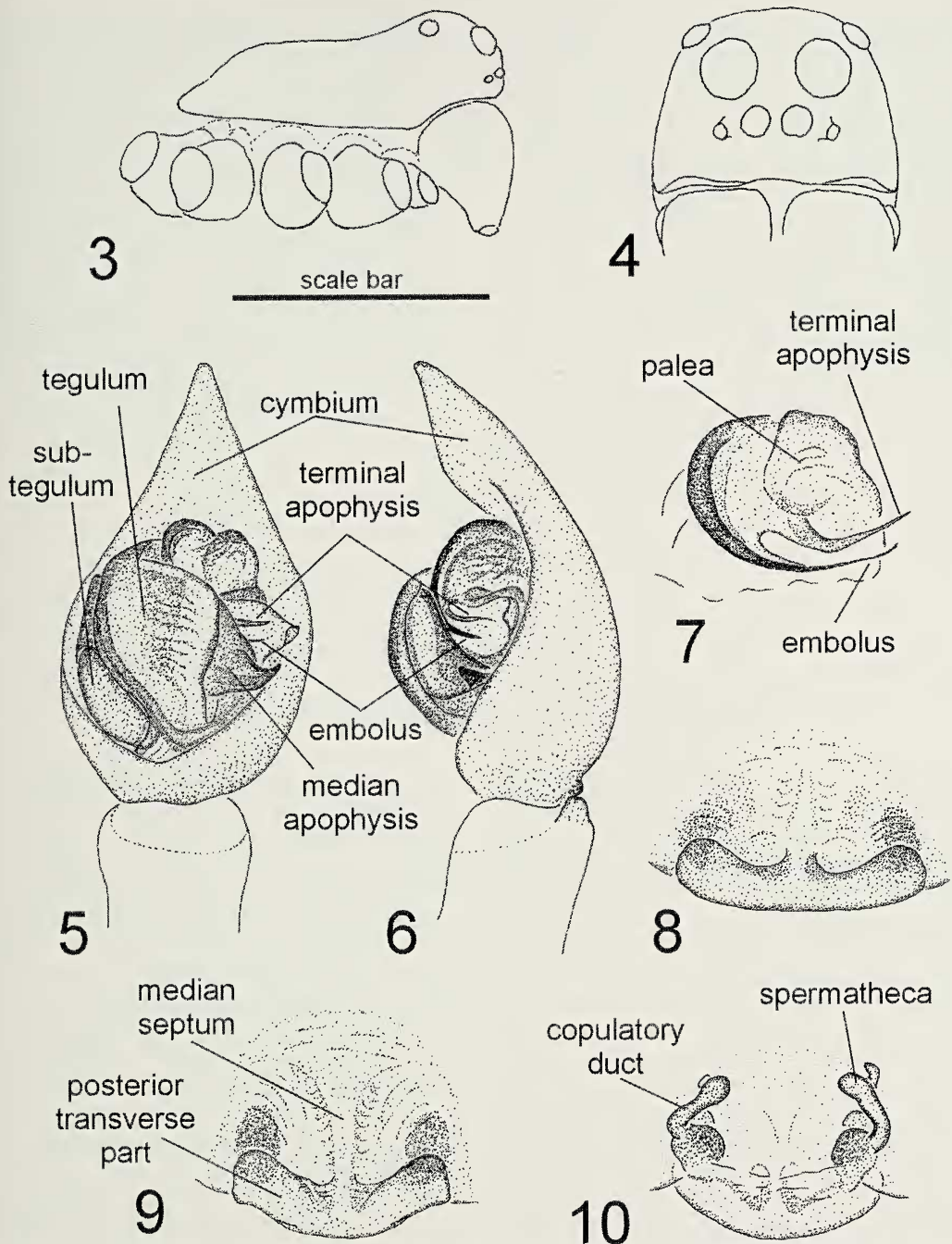
Anoteropsis longipes L. Koch 1878: 973–974, plate 85, figs. 2, 2a.

Lycosa maini McKay 1979: 260–263, figs. 7a–e; McKay, 1985b: 80. NEW SYNONYMY.

Lycosa mainae McKay.- Platnick 1989: 372.

Types.—*Anoteropsis longipes*: holotype female, Australia, locality not given in L. Koch (1878), Bradley Collection (presumed lost, see Framenau in press; not examined). *Lycosa mainae*: holotype female, Western Australia, 88 km N. of Murchison River, 27°42'S, 114°09'E, 30 January 1969, on red soil with mulga, *Acacia aneura*, in turret burrow, R.J. McKay (WAM 69/115), examined. Paratypes: AUSTRALIA: *Western Australia*: 1 immature female, Billabong Roadhouse, near Shark Bay turn-off, 26°49'S, 114°36'E, 5 December 1972, R.J. McKay (QM W4668); 1 juvenile, 5 miles N. of Menzies, 29°41'S, 121°02'E, 1 September 1954, FN24, B.Y. Main (WAM 68/821); 2 penultimate females, Mount Magnet area, 28°05'S, 117°52'E, station 7, 323 mile peg Mt Magnet, 7–8 December 1968, R.J. McKay, J. Gilbert, J. Ayres (WAM 69/1031, 69/1036); 1 juvenile, Murchison, 19 km N., 29°38'S, 115°57'E, 20 February 1962, A.R. Main (WAM 68/820); 2 juveniles, Norseman, 76 km N., 31°33'S, 121°47'E, 26 December 1968, W.H. Butler (WAM 69/105–6); 1 juvenile, 220 mile peg, Paynes Find, 29°15'S, 117°41'E, 8 December 1968, R.J. McKay, J. Gilbert, P. Snowball (WAM 68/819); 1 juvenile, Tarin Rock Reserve, 33°06'S, 118°11'E, 22 May 1971, palisade burrows on loam and litter, A. Baynes (WAM 71/1859); 1 penultimate female, 1 penultimate male, Wubin, 32 km N.E., 30°06'S, 116°37'E, 14 July 1968, in large turret burrow, R.J. McKay, J. Gilbert, J. Ayres (WAM 68/817–8). All paratypes examined.

Other material examined.—AUSTRALIA: *South Australia*: 1 penultimate ♂, Dublin, 34°27'S, 138°21'E, 16 May 1986, B.Y. Main, FN11 (WAM T62718); 1 juvenile, Mal-labie Shed Tank, 18 miles W., 31°28'S, 130°20'E, 23 December 1952, B.Y. Main, FN40 (WAM T62719). *Western Australia*: 1 juvenile, Arnolds Tank (PWD tank 488), N. of Wialki, 28°39'S, 122°36'E, 24 April 1957, A.R. Main, FN1, BYM 1957/A10, palisade, thick litter under *Acacia* (WAM T46842); 1 ♂, Francois Peron National Park, 25°52'31"S, 113°32'59"E, 24 August–10 November 1994, wet pitfall traps, A. Sampey et al., WAM/CALM Carnarvon Survey (WAM T48038); 1 juvenile, Francois Peron National Park, 1.6km NW of Monkey Mia Road, 25°50'20"S, 113°36'23"E, 18 January–23 May 1994, wet pitfall traps, M.S. Harvey et al., WAM/CALM



Figures 3–10.—*Mainosa longipes* (L. Koch, 1878): Male from 'Sieda', near Grass Patch, Western Australia (WAM T62713): 3. Carapace, lateral view; 4. Eyes, frontal view; 5. Left pedipalp, ventral; 6. Left pedipalp, retrolateral; 7. Apical part of bulb. Female holotype of *Lycosa mainae*, 88 km N. of Murchison River, Western Australia (WAM 69/115): 8. Epigynum, ventral view; 9. Epigynum, dorsal view. Female from Nerren Nerren, Western Australia (WAM 94/1940): 10. Epigynum, ventral view. Scale bar: (3) 2.70 mm, (4) 1.44 mm, (5–6) 0.66 mm, (7) 0.42 mm, (8–10) 0.80 mm.

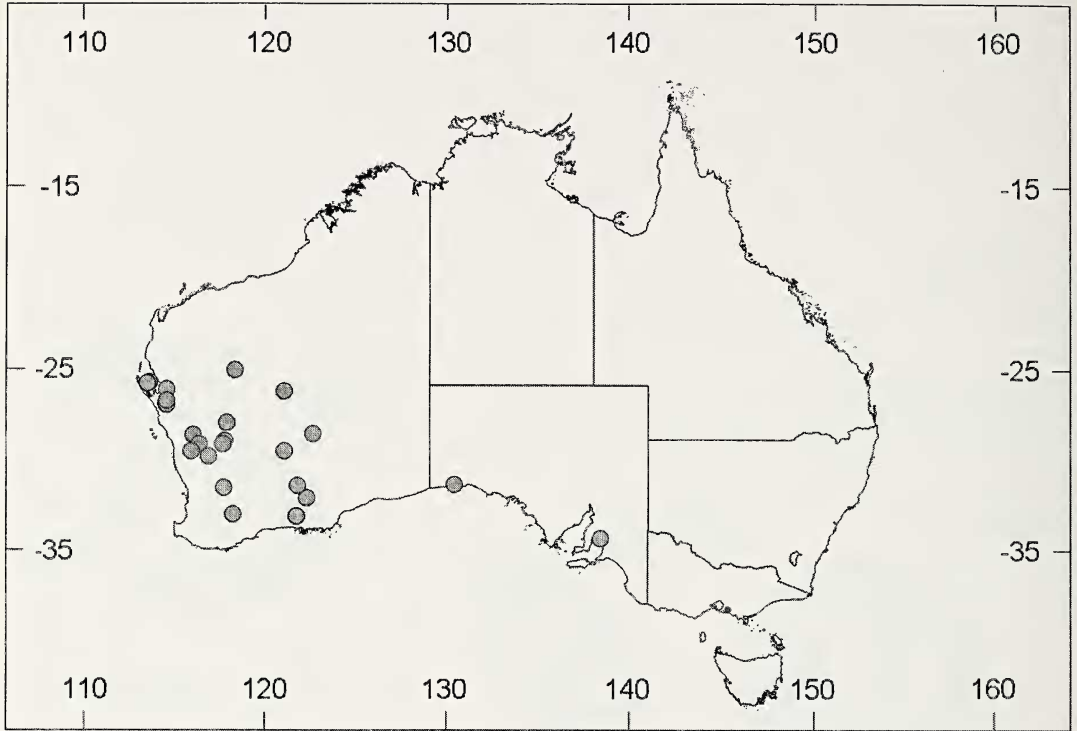


Figure 11.—Records of *Mainosa longipes* (L. Koch 1878).

Carnarvon Survey, site PE4 (WAM T62720); 1 ♂, 'Sieda', near Grass Patch, Fitzgerald Location 41, 33°13'56"S, 121°46'00"E, 20 September 1988, A.F. Longbottom, in house on desk near telephone, S233 (WAM T62713); 1 juvenile, Grass Patch, E. of, Fitzgerald Location 71, 33°13'S, 121°43'E, 17 December 1980, A.F. Longbottom, web-lined burrow amongst leaf litter, S62 (WAM T53625); 1 juvenile, Gutha, 15 miles N., 28°44'S, 116°01'E, 18 August 1953, B.Y. Main, palisade in *Acacia* litter, no silk, FN5 (WAM T53473); 1 penultimate ♀, Kellerberrin, 31°33'S, 117°43'E, 1 April 1993, G.T. Smith, leaves on entrance, M17 (WAM T62714); 1 penultimate ♀, Lorna Glen Station, 26°19'S, 121°02'E, 28 April 2004, K.E.C. Brennan, G. Owen, M. Moir, P.R. Langlands (WAM T58395); 1 juvenile, Morawa, S.E., nature reserve on Lochada Road, 29°15'29"S, 116°21'43"E, 12 October 1999, B.Y. Main, dug from burrow with palisade (WAM T62716); 1 ♀, Nerren Nerren Station, 4.0km E of Nerren Nerren boundary fence, E of North West Coastal Highway, 27°00'21"S, 114°32'29"E, 15 October 1994, J.M. Waldock, J. Riley, dug from burrow with palisade, WAM/CALM Carnarvon Survey,

site NE 4 (WAM 94/1940); 1 penultimate ♀, Nerren Nerren Station, 5.9km E of Nerren Nerren boundary fence, E of North West Coastal Highway, 27°03'28"S, 114°36'25"E, 18 October 1994, J.M. Waldock, WAM/CALM Carnarvon Survey, site NE5 (WAM 94/1941); 1 juvenile, Norseman, 29.2 miles E., on Eyre Highway, 32°12'S, 122°17'E, 8 December 1953, B.Y. Main, FN8 (WAM T46843); 1 ♀, North West Coastal Highway, 20.3km E, on Woodleigh—Byro Road, 22°12'31"S, 114°34'35"E, 12 October 1994, M.S. Harvey et al., WAM/CALM Carnarvon Survey, site WO2, from burrow with *Acacia* leaves palisade (WAM T62730); 1 juvenile, Oudabunna Station, 15.9km S. of Wydgee Homestead, 29°04'S, 117°45'E, 8 August 1982, B.Y. Main, FN13 (WAM T62715); 1 penultimate ♀, Paynes Find, 29°15'S, 117°41'E, 1 August 1982, B.Y. Main, FN14 (WAM T62717).

Diagnosis.—*Mainosa longipes* displays a unique color pattern among known wolf spiders. The abdomen is dark brown to black, with white transverse bars and lines in the posterior half of the abdomen (Fig. 1), less distinct in males.

Description.—*Male* (based on WAM

T62713): Carapace: head region strongly elevated (Fig. 3); overall dark brown, medially in front of fovea slightly lighter; indistinct dark radial pattern; covered with mainly silver-white setae, that are particularly dense between eyes and towards the carapace margins; some black setae between median and lateral bands on carapace flanks; one long brown bristle between AME, six long brown bristles below AE; clypeus high, more than one diameter of AME (Fig. 4). Eyes: row of AE shorter than row of PME; row of AE procurved (Fig. 4). Sternum: light brown with dense, black pigmentation; covered with brown bristles, which are longer towards the margin. Labium: brown; front end truncate and white. Chelicerae: dark brown with a dark longitudinal band; a few white setae and, medially, a few long brown bristles; three retromarginal teeth, with the apical slightly smaller; three promarginal teeth, with the median largest. Pedipalp (Figs. 5–7): embolus long and slender with its tip pointing slightly apically, terminal apophysis sickle-shaped (Fig. 7). Abdomen: very dark grey with indistinct light lanceolate heart mark in anterior half, its front end a more distinct orange patch; orange-whitish transverse bar medially and some thin transverse orange-whitish lines in posterior half; white setae medially in a band that widens posteriorly, otherwise brown setae; venter uniformly dark brown, laterally with irregular light spots; spinnerets yellow brown. Legs: leg formula $IV > I > II > III$; uniformly dark brown, coxae ventrally yellow-brown; spination of leg I: femur: 2 dorsal, 1 apicoprolateral; tibia: 3 ventral pairs, 2 prolateral; metatarsus: 3 ventral pairs, 1 retrolateral, 1 apicoventral, 1 apicoprolateral, 1 apicoretrolateral.

Female (based on holotype of L. mainae WAM 69/115): Carapace: very dark reddish-brown with indistinct radial pattern; most setae rubbed off, some silver-white setae on carapace flanks and between eyes. Eyes: row of AE shorter than row of PME, row of AE slightly procurved. Sternum: brown, long brown setae of increasing length and density towards margins. Labium: as in male. Chelicerae: black, few brown setae medially, dentition as in male. Epigynum (Figs. 8–10): ventral view: longitudinal part of median septum indistinct, but with distinct posterior transverse part of which the lateral ends are bent

forward; no anterior hoods (Figs. 8, 9); dorsal view: small spermathecae with dorsal appendix (Fig. 10). Abdomen: very dark brown with a wide light-brown patch anteriorly; white transverse bars in posterior half; covered in brown setae, whitish setae in transverse bars, some longer light brown setae in area of lanceolate heart mark. Venter as in male; spinnerets brown. Legs: leg formula $IV > I > II > III$; uniformly dark brown, apical segments somewhat darker; dense scopulae on tarsi, metatarsi and apical two thirds of tibiae of leg I and II, on tarsi and metatarsi of leg III and tarsi of leg IV; spination of leg I: Femur: 3 dorsal, 2 apicoprolateral, 1 apicoretrolateral; patella: 1 prolateral; tibia: 3 ventral pairs, 1 prolateral; metatarsus: 3 ventral pairs, 1 apicoventral.

Measurements: Male, WAM T62713 (female holotype of *L. mainae*, WAM 69/115): TL 5.92 (14.10), CL 3.24 (6.58), CW 2.12 (4.51). Eyes: AME 0.19 (0.22), ALE 0.11 (0.22), PME 0.32 (0.70), PLE 0.25 (0.48). Row of eyes: AE 0.68 (1.41), PME 0.79 (1.60), PLE 0.95 (1.83). Sternum (length/width) 1.49/1.27 (2.54/1.97). Labium (length/width) 0.36/0.44 (0.71/0.89). AL 2.26 (6.96), AW 1.97 (5.17). Legs: lengths of segments (femur + patella/tibia + metatarsus + tarsus = total length): Pedipalp 1.41 + 1.41 + — + 0.94 = 3.76, I 3.81 + 4.65 + 4.09 + 2.26 = 14.81, II 3.38 + 4.37 + 3.81 + 1.97 = 13.53, III 3.24 + 4.09 + 3.81 + 1.83 = 12.97, IV 4.65 + 5.50 + 5.78 + 2.26 = 18.15 (Pedipalp 2.54 + 2.63 + — + 2.07 = 7.24, I 4.70 + 5.64 + 3.48 + 1.88 = 15.70, II 4.51 + 5.36 + 3.29 + 1.79 = 14.95, III 3.85 + 4.51 + 3.29 + 1.69 = 13.34, IV 5.08 + 6.67 + 5.92 + 3.10 = 20.77).

Variation: The dimensions of a second male, WAM T48038 (2 females, WAM 94/1940 and WAM T62730) are: TL 9.31, CL 5.08, CW 3.29 (TL 12.41, CL 6.77, CW 4.98 and TL 13.24, CL 6.49, CW 4.04).

Remarks.—The female holotype of *Anoteropsis longipes*, described from Bradley's Collection, is considered lost (Framenau 2005). However, L. Koch's (1878) description of the distinct color pattern of this species and his illustration of the female genitalia allow an accurate identification of this species. Ludwig Koch (1878) did not give any locality for his specimen, however, it is not unlikely that the spider was from Western Australia as the

Bradley Collection included other spiders collected in this state, e.g., the type material of *Tetrallycosa oraria* (L. Koch 1876) from King George Sound near Albany (L. Koch 1876; see also Framenau et al. 2006).

Habitat preferences and life cycle.—*Mainosa longipes* appears to prefer open *Acacia* woodland and mallee with red clay to sandy soils (McKay 1979). Here, it constructs palisades of elongate leaves or phyllodes around the mouth of its burrow (Fig. 2). Palisades are generally constructed in heavy leaf litter below shrubs and trees, usually on the side of the tree where the afternoon sun falls (McKay 1979). A penultimate and a mature male were caught in May, a second mature male in September which suggests that this species is reproductively active in winter.

Distribution.—South Australia and Western Australia south of 25°S latitude (Fig. 11).

DISCUSSION

Mainosa longipes belongs to the subfamily Lycosinae as the male pedipalp has a transverse median apophysis with a sinuous channel on its dorsal surface (Dondale 1986). The closest relatives may be found in the genus *Dingosa* Roewer 1955, represented by *Dingosa simsoni* (Simon 1898) and the currently misplaced Australian lycosines '*Pardosa*' *serrata* (L. Koch 1877) and '*P.*' *humphreysi* McKay 1985a. Similar to *Mainosa*, *Dingosa* species construct turrets around their burrows and males have extremely elongated legs. However, genital morphology and coloration of *Dingosa* differ considerably from *Mainosa*. The male pedipalp in this genus has a large palea region with a broad, truncated (not sickle-shaped) terminal apophysis. The median apophysis of these species is not triangular, but slim and elongated apically. In addition, the coloration of the Australian *Dingosa* is very different as the abdomen displays a characteristic serrated pattern with dark chevrons but no transverse bars. A revision of this genus, that contains a further two undescribed Australian representatives, is forthcoming.

Turret-building is not only restricted to Australian wolf spiders. Some species of the Holarctic genus *Geolycosa* Montgomery 1904, such as *G. missouriensis* (Banks 1895), also construct palisades around the opening of their burrow entrance (Wallace 1942; G. Stratton pers. comm.). The New Zealand *Notocosa*

bellicosa (Goyen 1888) extends the opening of its burrow with a rim of silk into which it incorporates pieces of debris (Vink 2002). The benefits of these palisades are currently unknown. In mygalomorph spiders of the genus *Aname* L. Koch 1873, burrow turrets appear to have some significance in relation to regular sheet-flood events (Main 1993). Alternative functions may include a barrier against debris that could otherwise fall into the burrow. The palisades could also play an important role in foraging. Prey may be attracted to the palisade as an elevated resting place and the turret also provides the spider with a vantage point since they can be seen sitting on the top of the turret during the day (pers. obs.). Finally, palisades may have an important thermoregulatory function such as to avoid hot surface air to penetrate the burrow.

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